



NASA Community Workshop on the Global Exploration Roadmap

**Kossiakoff Conference Center
John Hopkins University
April 10-11, 2014**

**International Standards to Promote Interoperability
*International Docking System Standard (IDSS)***



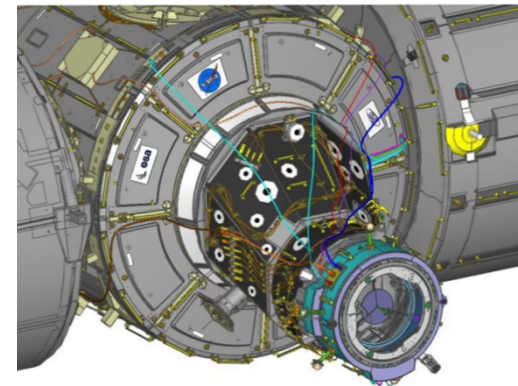
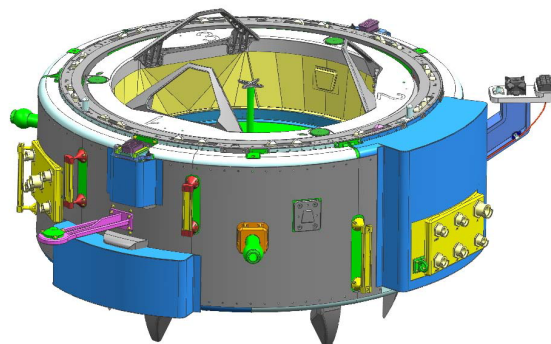
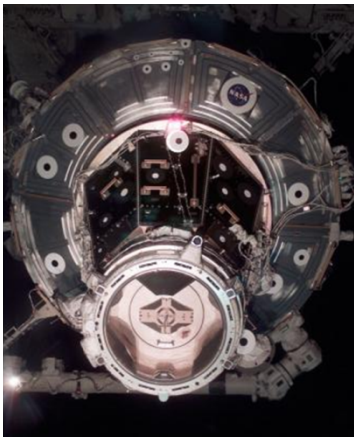
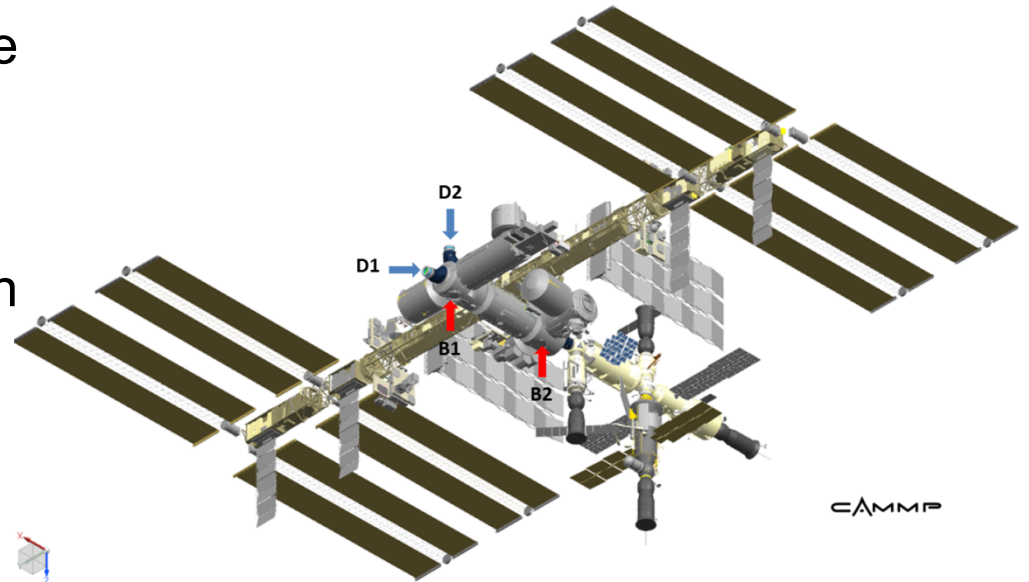
IDSS Objectives

- Goal is to enable exploration collaboration between partners using different spacecraft
- Chartered to develop a standard docking interface
 - Crew rescue between different spacecraft types
 - Integrated space operations among nations and spacecraft, including commercial, for both cargo and crew
 - Assembly of spacecraft modules
- Interface must adhere to dimensional and operational standards,
 - Accommodate vehicle mass from 5 to 375 tones
 - Operate in deep space
 - Fully androgynous
- IDSS should not dictate docking system design solutions, only physical mating interface requirements



Demonstration at ISS

- NASA is implementing IDSS on ISS to gain operation experience
- Two International Docking Adapters (IDA) are being developed for implementation on the International Space Station



Current PMA Configuration International Docking Adapter Two IDSS Compatible Ports on ISS



Progress to Date

- IDSS Interface Definition Document (IDD) Basic Revision baselined 9/2010
 - Identified basic description of physical mating interface
- Revision A 5/2011
 - Added mechanical soft capture, sensor, seal, hook stiffness, bonding and separation system requirements
- Revision B 2/2013
 - Added hard capture system geometric parameters & separation force
- Revision C 11/2013
 - Added soft capture system geometric parameters & updated Initial Contact Conditions

All physical mating interface parameters (soft and hard capture systems) that allow physical connection between spacecraft now available



Road Ahead

2014 2015 2016 2017 2018 2019 2020 2021

IDSS Revision D

Electrical Connectors, Targets, Cleanup



ISS Outfitted with IDA (IDSS Compatible Adapters)

IDSS Revision E

Fluid Connectors, Cleanup

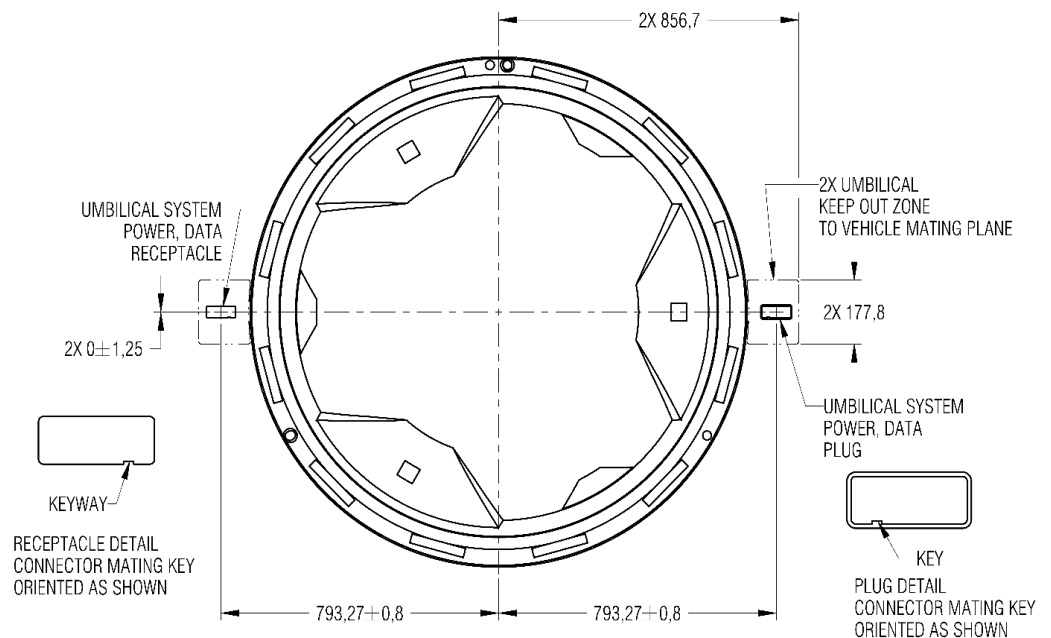
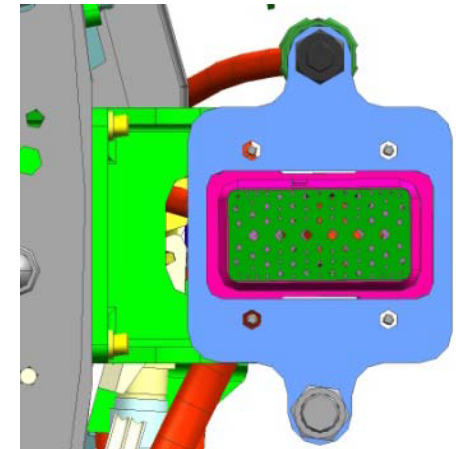
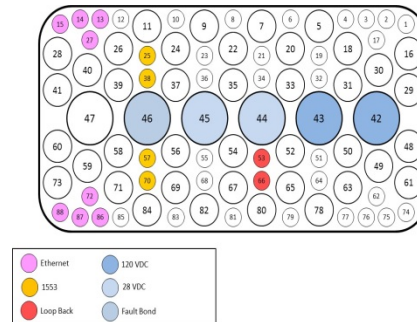
Vehicle Operations at IDA Ports

IDSS will evolve through operational experience on ISS



Electrical Umbilicals

- Proposed Electrical Interface provides flexibility
 - Data: Ethernet, MIL-STD-1553
 - Power: 120VDC, 28VDC
 - Loop back (connection confirmation)
 - Fault bond
 - Growth provisions
- Based on flight proven FRAM connector currently used on ISS
- Implemented on IDA and NDS



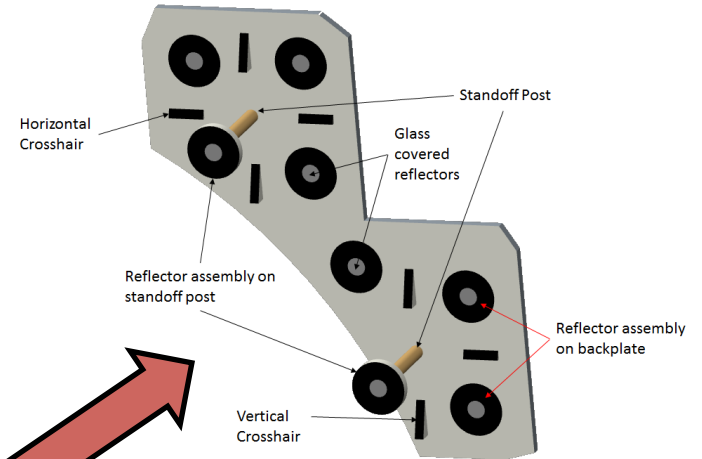
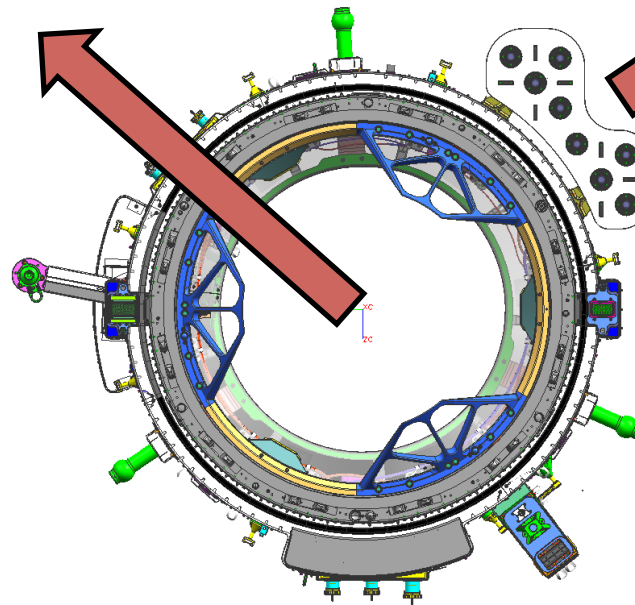


Docking Targets

Docking targets used on ISS/IDA are proposed as standards for next IDSS Revision



Centerline Target
Retained from PMA



Peripheral Target
Compatible with planned navigation and docking sensors such as visual, thermal, and lidar



IDSS Lessons Learned

- IDSS Development has identified a number of lessons learned:
 - Avoid or minimize project specific design development, baseline, test and fabrication prior to completion of standards development
 - NDS committed development schedule slowed by complex IDSS design negotiations
 - Face-to-face communication & understanding of technical design details greatly enhanced during face-to-face meetings vs. telecoms
 - Many agreements made during telecoms were reversed during face-to-face meetings
 - Language translation and communication break-down were often to blame
 - Export Control & Proprietary data issues require focused attention to avoid work stoppage or slow-down

Backup



IDA FRAM Plug and Receptacle Umbilical Connector

